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TECHNICAL DESCRIPTION
of
COMPONENT PARTS
for
VOICE SWITCH BY-PASS

Dated

March 25, 2010

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1.0 DOCUMENT PURPOSE

This document provides a technical description of Voice Switch By-Pass component parts that, when configured together in a site specific manner, provide Air Traffic Controllers emergency access to air-to-ground (A/G) radio transmitter and receivers during a failure of the voice switch system.

The Voice Switch By-Pass (VSBP) provides operators with EMERGENCY access to and control over government-furnished very high frequency (VHF) and ultra-high frequency (UHF) radio receiver/transmitters and associated signaling systems. The A/G connectivity enables air traffic controllers to establish and maintain communications with aircraft. The VSBP connections to A/G communications resources will be made by way of interfaces to government furnished distribution frames or other distribution points.

2.0 SYSTEM REQUIREMENTS AND CHARACTERISTICS

The VSBP equipment is typically installed in FAA Terminal Radar Control (TRACON) and Air Traffic Control Tower (ATCT) facilities that operate under Instrument Flight Rules (IFR). Within these facilities, designated air traffic control (ATC) positions equipped with a VSBP jackbox have emergency air-to-ground communications capability in the event of a voice switch system failure.

The following are the minimum FAA requirements of the VSBP system:

1. The VSBP will be totally independent of the voice switch system.

2. The VSBP will provide direct connectivity between the controller and the air/ground radio equipment for the primary frequency (s) assigned to that operation position.

3. The VSBP will be activated by a positive action of the controller. Automatic by-pass activation shall not occur.

4. The VSBP will provide a push-to-talk (PTT) signal compatible with the PTT requirements of the interfacing primary radio system (local or remote).

5. The VSBP will provide an audio path (transmit and receive) compatible with the audio requirements of the interfacing primary radio system (local or remote).

6. The VSBP will be capable of manual reassignment and connection of radios to positions (e.g., reconfigurable by interface patch panel).

7. The VSBP will provide an interface compatible with the facility recorder system.

The VSBPs are configured and equipped in accordance with facility worksheets provided when each system is ordered.

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2.1 MAJOR UNITS

A typical site specific configuration of Voice Switch By-Pass component parts consists of the following major units:

- 72 Inch Cabinet housing one or more equipment shelves providing housing for the following modules/items:
  - Uninterruptible Power Supply (UPS)
  - Power Supply Module
  - Fuse Module
  - Dual 9 Way Active Data Bridge Module
  - Relay Modules
  - Backplane
  - 66 Terminal Punch Block
- Jackboxes and associated cables. The Voice Switch By-Pass can interface with up to four (4) Jackbox Units per "19 x 7" Equipment Shelf depending on site specific Air Traffic Control requirements. Radio Cables interface the Voice Switch By-Pass to the appropriate radio equipment

2.2 POWER

Power (120 VAC) to operate the VSBP set of equipment is provided from a facility electrical panel board to a standard duplex outlet (CLIN X038). The VSBP set of equipment normally includes an Uninterruptible Power Supply (UPS) (CLIN X006, X007, X008). CLIN X006 supports 1-3 "19 x 7" Equipment Shelves of modules, CLIN X007 supports 1-5 "19 x 7" Equipment Shelves of modules and CLIN X008 supports 1-7 "19 x 7" Equipment Shelves of modules.

2.2.1 Internal Power

The VSBP "19 x 7" Equipment Shelf shall accommodate a Power Supply Module that is connected to either the VSBP UPS or the duplex outlet. Each "19 x 7" Equipment Shelf shall contain one Power Supply Module powering the circuits within that shelf. The failure of one internal power supply shall not affect communications on other "19 x 7" Equipment Shelves within the 72 Inch Cabinet. In an emergency, two "19 x 7" Equipment Shelves can be powered by one Power Supply Module.

2.2.2 External Interfaces

The VSBP set of equipment shall provide external interfaces to receive, transmit and record designated A/G frequencies. Push to talk (PTT) interface usually consists of "dry contact" type or "current loop" capability. Some of the applications require a DC voltage. Once determined, the correct method is configured by the placement of Backplane jumpers. Continuity (dry contact) from the radio shall be provided by contact closure in the VSBP Relay Module. When "voltage" PTT or keying is required locally, a separate Power Supply Module is required (CLIN XX22) or (CLIN XX47).

The VSBP set of equipment provides interface with local radios that may or may not use a common antenna for the main and standby equipment. The relay switching within the bypass shall have the provision to interrupt the antenna M/S contact closure from the voice switching system and provide either an open, short or a voltage (voltage is externally supplied) to operate the antenna relay.

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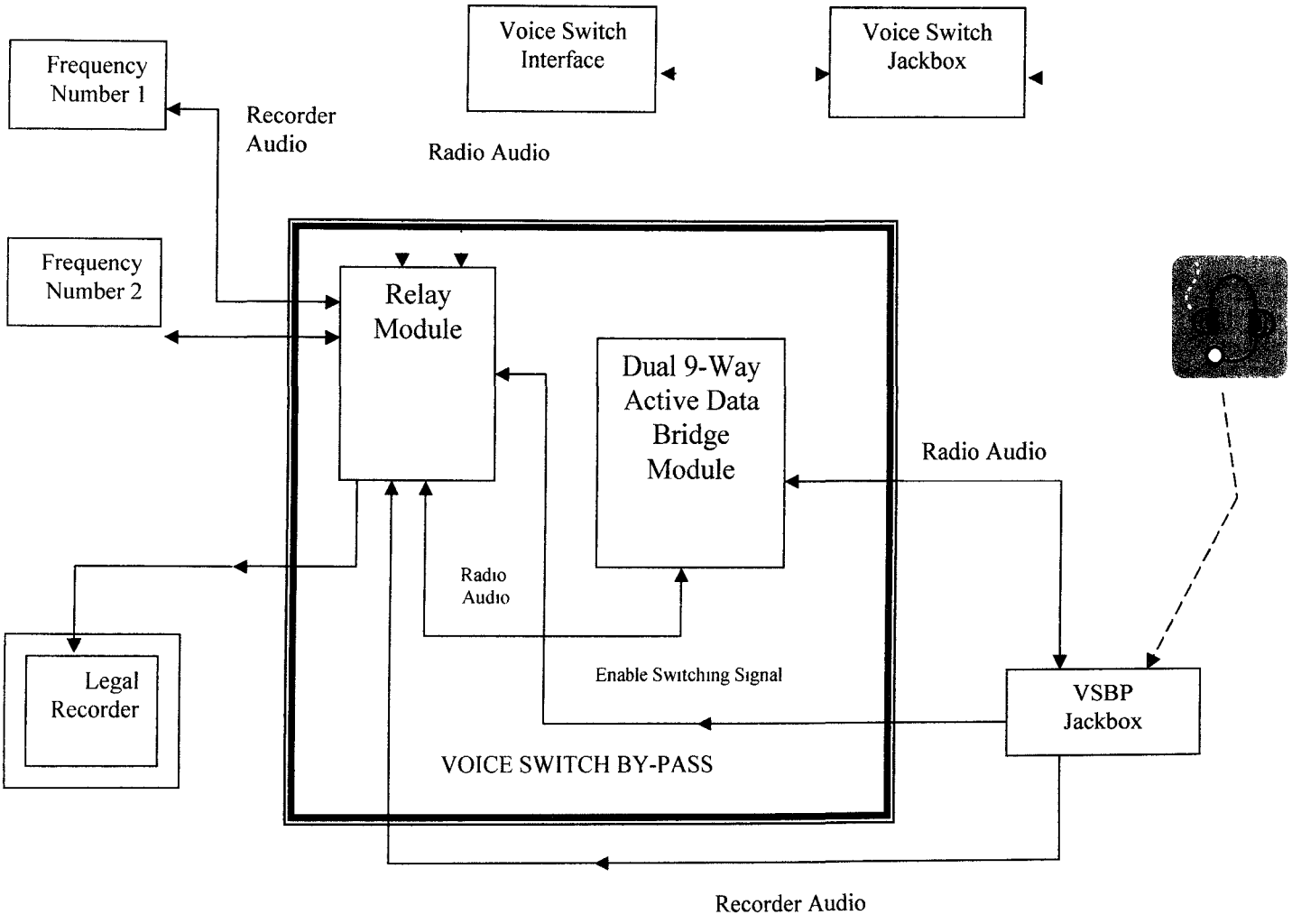

Voice Switch By-Pass Functional Block Diagram

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2.3 TECHNICAL PERFORMANCE

2.3.1 Voice Channel Performance

The frequency response over the frequency range from 300 to 3000 Hz shall not vary by more than +/- 2 dB of the value measured at 1000 Hz.

2.3.2 C-Message Noise

A/G C-message noise shall not exceed 20 dBrnC0.

2.3.3 kHz Background Noise

A/G 3 kHz background noise shall not exceed 39 dBrn0.

2.3.4 Headset/Handset (HS) Volume Control

Nominal +10, -15dB.

2.3.5 Transmit Path

Frequency response	300 to 3000 Hz +/- 3dB
Harmonic distortion	2.5 percent maximum
Interchannel crosstalk	-50 dB below normal signal
Noise Level	-65 dBm maximum

2.3.6 Headset Receive Audio Path

Frequency response	300 to 3000 Hz +/- 3dB
Harmonic distortion	2.5 percent maximum
Interchannel crosstalk	-50 dB below normal signal
Noise Level	-45 dBm maximum

3.0 APPLICABLE DOCUMENTS

The following documents form a part of this technical description to the extent specified herein. Copies of standards, drawings and publications may be obtained from the contracting officer.

SPECIFICATIONS:

Federal Aviation Administration (FAA)

FA-G-2100H Electronic Equipment, General Requirements (May 9, 2005)

STANDARDS:

Federal Aviation Administration (FAA)

FAA-STD-013d Quality Control Program Requirements

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FAA-STD-021 Configuration Control, contractor requirements

Military

Federal

FED-STD-595 Colors

OTHER PUBLICATIONS:

ANSI/ASQC Q-9003-1994 Quality Systems Model for Quality Assurance in Final Inspection and Test
ANSI/EIA 310, Standard RS-310-C-77 Cabinets, Racks, Panels
IEEE (587/ANSI) C62.41-1991 Surge Voltages in Low-Voltage AC Power Circuits, Recommended Practice for

4.0 TECHNICAL DESCRIPTION OF COMPONENT PARTS

The Voice Switch By-Pass set of equipment is a modular, site specific configuration set of component parts. The following provides the mechanical, electrical and interface characteristics of the component parts identified in paragraph 2.1 Major Units, above. A site may be configured with one or more of each of these component parts.

4.1 72 INCH CABINET - CLIN XX04

The 72 Inch Cabinet is a commercial-off-the-shelf equipment rack with adjusting mounting rails that can accommodate up to seven fully-loaded Voice Switch By-Pass "19 x 7" Equipment Shelves. The 72 Inch Cabinet may house an optional cooling air fan, the fully loaded Voice Switch By-Pass Equipment Shelf(s) including two 66 Terminal Punch Blocks, the UPS, and an optional Rack Mounted Power Strip. The finish of the 72 Inch Cabinet shall be smooth, lusterless light brown per FED-STD-595 #30372. The overall height shall be 78 inches with a depth of 22 inches and a width of 25.50 inches. The 72 Inch Cabinet includes side panels, covers, cowling, a ground buss bar, and a hinged rear access door for servicing the component parts. The rear door shall be flush mounted louvered with a lock.

4.2 "19 X 7" EQUIPMENT SHELF – CLIN XX09

The "19 x 7" Equipment Shelf shall be mountable in the 72 Inch Cabinet, and shall be a mounting shelf for a Power Supply Module, a Fuse Module, Dual 9 Way Active Data Bridge Modules, Relay Modules and the Backplane. The material used to construct the shelf shall be 16-gauge steel with a black texture finish. The overall dimensions are 19 inches wide, by 20 inches deep by 7 inches high. The 72 Inch Cabinet mounting hole pattern shall be in accordance with ANSI/EIA 310, Standard RS-310-C-77, 1U, 2U and 3U. There shall be twelve slots for plug-in modules.

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4.3 BLANK-OFF PLATE – CLIN XX16

The Blank-off Plate shall fit any of the twelve plug-in module slots on the "19 x 7" Equipment Shelf to vertically cover the space of a plug-in module slot, and shall be attachable in the same manner as a plug-in module.

4.4 BACKPLANE – CLIN XX13

The Backplane for the "19 x 7" Equipment Shelf shall be removable and shall allow interface to the facility demarcation providing connectivity to A/G radio transmitters and receivers. The Backplane provides for a maximum of three circuit types, four Jackbox Unit interfaces, and seven radio channel interfaces. Jumpers and switches located on the rear of the Backplane shall provide for antenna switching and provide for Push-to-Talk signaling.

The Backplane shall be fabricated per FAA-G-2100H, paragraph 3.3. The printed circuit board shall be fabricated per FAA-G-2100H, paragraph 3.3, containing 2 each, 10 position, dual row headers, 1 each, 14 position dual row header, 10 each, 56 pin press-fit connectors, 4 each, 15 pin, female, press-fit connectors, 7 each, 25 pin, female, press-fit connectors and 1 each 8 pole, double throw, slide switch, 2 each, blocking diodes and 11 each shorting shunts. Backplane is 17.07 inches wide, 5.5 inches high and 0.12 inches thick. Backplane marking per FAA-G-2100H, paragraph 3.3.3.2.

The Backplane receives 24Vdc from the Power Supply Module. The 24Vdc passes through the Fuse Module and shall be distributed across the Backplane to its module interface connectors.

4.5 UNINTERRUPTIBLE POWER SUPPLY (UPS) – CLINS XX06, XX07, XX08

The Uninterruptible Power Supply is a 700 VA/490 W, or a 1000 VA/700 W, or a 1500 VA/1050W (depending on the load requirements of the facility specific configuration). The Uninterruptible Power Supply shall be mountable, fitting into the 72 Inch Cabinet and resting on the UPS Shelf, a bottom shelf. The Uninterruptible Power Supply connects to the 120 Vac Duplex Outlet power source. The UPS power output to the internal VSBP set of equipment is 120 Vac.

4.5.1 Mechanical Characteristics

CAPACITY (VA)	HEIGHT (IN.)	WIDTH (IN.)	DEPTH (IN)	WEIGHT (LBS)
700	3.5	19.0	19.4	34
1000	3.5	19.0	19.4	34
1500	3.7	19.0	19.4	50

4.5.2 Electrical Characteristics

Input Voltage Range: 85 to 144 Vac
Input Current: 5.4 to 12.5 A (depending on Uninterruptible Power Supply capacity)
Input Power Factor: 0.95 Typical
Frequency Range: 50/60Hz ± 3Hz
Surge Protection: per IEEE 587/ANSI C62.41

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Output Wave From:	Sine wave
Output voltage:	120 Vac ±3%
Common Mode Noise Rejection	>60 dB @ 100 kHz
Transverse Mode Noise Rejection	>80 dB @ 100kHz
Audible Noise Normal Mode	45 dBA
Outlets	5-15R (4)
Batteries:	12 Vdc, 5 Ah, maintenance-free rechargeable lead acid
Agency approvals:	Safety - UL 1778 EMC – FCC Part 15 Class A or B (Capacity dependent)

4.6 RELAY MODULE – CLIN XX21

The Relay Module mounts in a slot (A5, A6, A8, A9, A11, A12) on the "19 x 7" Equipment Shelf. The Relay Module shall provide four independently operated relays. The relay contacts each provide four sets of form C transfer (break before make) contacts. Up to six (6) Relay Modules may be installed in one '19 X 7" Equipment Shelf. The Relay Module shall mate with a 56 pin connector on the Backplane.

4.6.1 Mechanical Characteristics

Weight:	9.5 ozs
Height:	5.58 inches
Width:	1.42 inches
Depth:	5.96 inches

4.6.2 Electrical Characteristics

Coil Resistance:	1150 ohms ± 10%
Must-operate voltage:	19 Vdc
Must-release voltage:	2 Vdc
Maximum contact current:	1 A
Maximum apparent power:	10 VA
Maximum contact voltage:	100 Vdc
Typical operate time:	20 ms
Typical release time:	60 ms

4.6.3 Interface

RELAY MODULE CONNECTOR PIN ASSIGNMENTS

INTERFACE	K1	K2	K3	K4
COIL, POS.	56	42	28	14
COIL, NEG.	55	41	27	13
NORMALLY CLOSED	47, 48, 53, 54	33, 34, 39, 40	19, 20, 25, 26	5, 6, 11, 12
NORMALLY OPEN	43, 44, 49, 50	29, 30, 35, 36	15, 16, 21, 22	1, 2, 7, 8
COMMON	45, 46, 51, 52	31, 32, 37, 38	17, 18, 23, 24	3, 4, 9, 10

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4.7 DUAL 9 WAY ACTIVE DATA BRIDGE MODULE - CLIN XX24

The Dual 9 Way Active Data Bridge Module mounts in a slot (A4, A7, A10) on the "19 X 7 " Equipment Shelf. Up to three (3) each Dual 9 Way Active Data Bridge Modules may be installed in one "19 x 7" Equipment Shelf. The Dual 9 Way Active Data Bridge Module shall provide 4 wire transmission interconnection between a dedicated common port and eight multiple ports. The Dual 9 Way Active Data Bridge Module shall incorporate a splitter channel and a combiner channel. Multiple inputs are connected to a common combiner channel output, and in the splitter channel, a common input is connected to multiple outputs. Splitter and combiner channels are separate and independent, allowing for operation in full duplex data transmission mode. The Dual 9 Way Active Data Bridge Module shall mate with a 56 pin connector on the Backplane.

4.7.1 Mechanical Characteristics

Weight:	16 ozs
Height:	5.58 inches
Width:	1.42 inches
Depth:	5.96 inches

4.7.2 Electrical Characteristics

Input Power:	-24 to –56 Vdc, 60mA, maximum
Splitter and Combiner Channel Loss/Gain:	-30 to +10 dB usable range (switch selectable)
Maximum Output Level (Overload Point):	Combiner +12 dBm, Splitter + 5dBm
Level Change with Loading:	1 dB maximum, one port to all ports loaded
Input and Output Port Impedance:	Splitter (multiple ports) and combiner (common port): 600 ohms balanced
Harmonic Distortion:	Splitter: less than 1% at +3 dBm Combiner: less than 1% at +8 dBm
Noise:	20 dBrnC, maximum
Frequency Response:	± 1 dB re 1000Hz level, 300 to 5000Hz
Delay Distortion:	Less than 75 µs, 400 to 3000 Hz
Cross-Port Coupling Loss (Crosstalk):	Greater than 55 db

4.7.3 Interface

Input voltage: -V Pin 35, GND Pin 17

Combiner Common Output: T Pin 41, R Pin 47, SX Pins 43 or 45

Splitter Common Input: T Pin 7, R Pin 13, SX Pins 9 or 11

COMBINER/SPLITTER PORT PIN NUMBER ASSIGMENTS

	PORT1	PORT2	PORT3	PORT4	PORT5	PORT6	PORT7	PORT8
T	31/21	37/19	39/15	49/5	56/2	54/4	52/6	50/8
R	29/25	55/23	53/1	51/3	42/16	44/14	46/12	48/10

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4.8 FUSE MODULE – CLIN XX25

The Fuse Module mounts in slot A3 on the "19 x 7" Equipment Shelf in the first slot to the right of the Power Supply Module and provides fusing for the modules in the other positions on the same Equipment Shelf. It shall also include an alarm lamp and an alarm relay for both local and remote indication of a blown fuse. The Fuse Module shall mate with a 56 pin connector on the Backplane.

Fuses are located on the front panel of the Fuse Module and are replaceable without taking the Fuse Module out of service. There shall be two groups of fuses numbered 1 to 6 and 7 to 13, respectively. Each group may be connectable to a separate power source. The front panel shall be equipped with an LED to provide visual indication of a blown fuse. A normally energized alarm relay shall provide two sets of isolated relay contacts for use with an external alarm enunciator. Each set of relay contacts shall provide both normally open and normally closed contacts.

4.8.1 Mechanical Characteristics

Weight:	8 ozs
Height:	5.58 inches
Width:	1.42 inches
Depth:	5.96 inches

4.8.2 Electrical Characteristics

Fuse Type:	Buss GMT, 0.50 ampere, unless otherwise specified
Alarm Input Voltage Range:	-24 to –72 Vdc, filtered, positive-ground referenced
Input current:	10 A maximum per circuit (two circuits)

4.8.3 Interface

- BATT Fuses 1 to 6 Pin 35
- BATT Fuses 7 t0 13 Pin 32

GND Pin 17
Alarm Relay K1: Normally Open Pin 6, Common Pin 10, Normally Closed Pin2
Alarm Relay K1: Normally Open Pin 12, Common Pin 4, Normally Closed Pin8
External Alarm Input: Pin 36

FUSE MODULE PIN NUMBER ASSIGNMENTS

FUSED OUTPUT	PIN	FUSED OUTPUT	PIN
1	55	7	25
2	51	8	21
3	47	9	13
4	43	10	9
5	39	11	5
6	29	12	1
		13	3

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4.9 POWER SUPPLY MODULE – CLIN XX22

The Power Supply Module mounts in slot A1 and A2 on the left side of the "19 x 7" Equipment Shelf. The Power Supply Module shall provide filtered, regulated 24 Vdc output power at 4.0 amperes. It shall operate from nominal 120 Vac commercial line voltage at 50 or 60 Hz and require a maximum of 2.5 amperes of current.

The Power Supply Module shall have a floating output that can be used to supply either negative or positive ground referenced DC voltage. The DC output shall be capable of floating up to ± 150 volts away from ground.

The output voltage of the Power Supply Module shall be provided on a 3-position screw terminal barrier strip on the rear of the module. Also located on the rear of the module shall be an appliance cord for connection to the 120 Vac source. The front of the Power Supply Module shall contain an LED indicator, lit when the Power Supply Module is powered on.

4.9.1 Mechanical Characteristics

Weight:	2.8 pounds
Height:	5.58 inches
Width:	2.88 inches
Depth:	6.25 inches (including barrier strip)

4.9.2 Electrical Characteristics

Line input power:	102 to 132 Vac, 50 to 60 Hz, 2.5 A rms steady state, maximum
Line conducted emissions:	All inputs and outputs protected from lightning induced transients per FCC Part 68
Safety:	UL 1459, CSA 22.2-234
DC Output:	24 ± 1.5 Vdc at 4.0 A
DC output ripple and noise:	Less than 5 mV rms to 50 kHz Less than 27 dBmC Less than 50 mV peak-to-peak, including spikes to 20 MHz No frequency component greater than 1 mV rms, 3000Hz to 5 MHz
DC output line regulation:	Less than100 mV with line varied from 102 to 132 Vac

4.10 JACKBOX UNIT – CLIN XX20

The Jackbox Unit shall provide, but not limited to, a receptacle jack for the controller's headset/mike plug, a volume control for receive/transmit audio, a sidetone audio, and an interface compatible with the facility voice recorder.

The Jackbox Unit shall operate from –24 Vdc. It shall contain a regulator to convert the –24 Vdc to those voltages required for the electronics of the Jackbox Unit. It shall provide a receptacle jack for the controller's headset/mike plug having separate tip and ring make connections to eliminate inadvertent shorting during insertion/withdrawal and a volume control knob for audio volume adjustment. It shall have an interface compatible with the facility voice recorder. The

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Jackbox Unit shall accept a balanced audio input and terminate this input with a 604 ohm resistor. The Jackbox Unit shall convert this balanced input into a single-ended audio signal for the headset.

The maximum headset output level shall be –13dBm. The Jackbox Unit shall produce a sidetone from its transmit audio path. The sidetone level shall be –20 dB ± 2 dB below the transmit audio level. The transmit audio shall be enabled by a Press-to-Talk switch that shall close an electronic switch in the Jackbox Unit. When this switch is closed the transmit audio shall be capacitor coupled to the Jackbox Unit's connector with a gain of 6.89 dB. This transmit audio signal shall be summed with the receive audio and output to the recorder pins of the Jackbox Unit's connector at a level of –10 dBm.

Selection of a radio frequency (RF) channel shall be accomplished by inserting the controller's headset/mike plug into the Jackbox Unit. While the channel is selected, the position shall receive all audio transmissions occurring on that channel and its push-to-talk (PTT) and transmit functions shall be enabled. Transmission on a selected RF channel shall be accomplished by pressing and holding the PTT switch for that position. A path for transmit audio shall be established from the position to the corresponding radio interface for that frequency until the PTT switch is released. Channel deselecting shall be accomplished by withdrawing(removing) the controller's headset/mike plug from the Jackbox Unit. The transmit side of the position Jackbox Unit is designated to be the 0 TLP. The receive side of the position Jackbox Unit is aligned for a -16 TL. The transmit radio interface is set for a 0 TL, and can be varied within limits of the interface module. The receive radio interface is set for a -16 TL, and can be varied within limits of the interface module. The facility voice recorder output is set for 0 TL.

4.10.1 Mechanical Characteristics

Electrical components and electronic assemblies shall be housed in a sheet metal enclosure consisting of a chassis and cover formed from 0.062-inch thick aluminum alloy. Mounting tabs are to be located on the front face with a single opening in each tab (located identically to holes in previously manufactured jackbox units for ease of replacement on-site) to accept a #4 countersunk machine screw. The enclosure shall be protected with an iridite solution and painted an international orange per FED-STD-595, Color No. 12197. The Jackbox Unit shall have a DB15 male connector on its rear face. The Jackbox Unit's weight and dimensions shall be as follows:

Weight:	17 ozs
Height:	1.62 inches
Width:	4.0 inches (without mounting flanges)
Depth:	7.66 inches

4.10.2 Electrical Characteristics

Input power:	-24 Vdc, 0.10 A, maximum
Received Audio:	Balanced pair,
Transmitted Audio:	Balanced pair
Record Output:	Balanced pair, -10 dBm, maximum
Headset Audio:	-13 dBm, maximum

4.10.3 Interface

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Connections to the Jackbox Unit's DB15 connector shall be as follows:

PIN NO.	SIGNAL NAME
1	TX AUDIO OUT(1)
2	RX INPUT (1)
3	PTT
4	GND
5	N/C
6	-24 Vdc
7	N/C
8	TO RCDR (1)
9	TX AUDIO OUT (2)
10	RX INPUT (2)
11	N/C
12	ENABLE
13	GND
14	N/C
15	TO RCDR (2)

4.11 CABLES

4.11.1 Jackbox Cable – CLIN XX14

The Jackbox Cable shall be a shielded, multi-conductor, signal plenum cable with six (6) pairs of twisted conductors with Mylar/aluminum foil shield. The Jackbox Cable shall meet UL Subject 13, Type CI2P cable requirements.

4.11.2 Connectorized Jackbox Cable– CLIN XX15

The Connectorized Jackbox Cable shall consist of the Jackbox Cable terminated with DB15 male and DB15 female, subminiature connectors with crimp contacts, hoods, strain relief clamps and jackscrews at opposite ends of the cable. The Connectorized Jackbox Cable shall be marked per FAA-G-2100H paragraph 3.3.3.2.

4.11.3 Radio Cable – CLIN XX19

The Radio Cable shall be a shielded, multi-conductor, signal plenum cable with twelve (12) pairs of twisted 24 AWG conductors and 24 AWG ground wire with Mylar/aluminum foil shield. The Radio Cable shall meet UL Subject 13, Type CI2P cable requirements. Radio Cable length shall be 36" +/- 2" in length. The Radio Cable shall be terminated at one end with a DB25 male, subminiature connector with crimp contacts, hood, strain relief and jackscrews. The Radio Cable shall be marked per FAA-G-2100H paragraph 3.3.3.2.

4.12 66 TERMINAL PUNCH BLOCK – CLIN XX23

The 66 Terminal Punch Block shall have a wall mounting bracket for mounting on the rear of the interior side of the 72 Inch Cabinet. It shall have a 100 pair capacity, field terminateable type 66

punch block with terminal row spacing of 0.25 inches. Its dimensions shall be 10 inches long, 3.4 inches wide and 1.2 inches deep. It shall be provided with mounting tabs, open-ended stand-off brackets molded from flame retardant thermoplastic and package of 100 each, tin-plated copper, bridging clips attached (part number 66M1-50 and SA1-100).

4.13 66 TERMINAL PUNCH BLOCK WITH 25 PAIR CONNECTORS – CLIN XX23A

The pre-wired 66 Terminal Punch Block with two 25 pair connector shall have a wall mounting bracket for mounting on the rear of the interior side of the 72 Inch Cabinet. It shall have a 100 pair capacity, field terminated type 66 punch block with terminal row spacing of 0.25 inches. Its dimensions shall be 10 inches long, 3.4 inches wide and 1.2 inches deep. It shall be provided with mounting tabs, open-ended stand-off brackets molded from flame retardant thermoplastic and package of 100 each, tin-plated copper, bridging clips attached (part number S66M4-50W2 and SA1-100).

4.14 IDENTIFIER PANEL – CLIN XX17

The Identifier Panel shall be a two-inch, single rack space strip that can be mounted just below each VSBP "19 x 7" Equipment Shelf to provide for placement of card labels.

4.15 POWER STRIP – CLIN XX26

A Power Strip (model number OB-15S) shall be mountable on the interior side to the rear of the Equipment Rack to provide surge protected 120 Vac into the Uninterrupted Power Supply or Power Supply Module.

4.16 UPS SHELF – CLIN XX37

The Uninterrupted Power Supply Shelf is a rack mounted equipment shelf that supports the UPS. The UPS shelf shall have a load rating of 150 lbs. The rack mounting hole pattern shall be in accordance with ANSI/EIA 310, Standard RS-310-C-77, 1U, 2U and 3U.

4.17 DUPLEX OUTLET – CLIN XX38

The Duplex Outlet shall be a standard 20 ampere 120 Vac duplex outlet and metal receptacle box with cover for mounting in the bottom of the 72 Inch Cabinet for the purpose of providing 120 Vac to the Uninterrupted Power Supply or Power Supply Module.

4.18 10 AMP POWER SUPPLY – CLIN XX47

The 10 amp Power Supply provides filtered, regulated 24 Vdc output power at 10 amperes. It shall operate from nominal 120 Vac commercial line voltage at 50 or 60 Hz. In a typical application, activation of the headset Push-To-Talk (PTT) switch provides relay contact closures

from the Voice Switch Bypass to the external equipment. The Voice Switch Bypass can be configured to provide voltage keying for PTT. This is accomplished by the use of an external Power Supply set to the required voltage punched into the appropriate 66 Terminal Punch Block terminals and the reconfiguration of jumpers on the Voice Switch Bypass Backplane printed wiring board.

5.0 QUALITY ASSURANCE PROVISIONS

5.1 QUALITY REQUIREMENT

A quality control program, consistent with the requirements of FAA-STD-013d, Quality Control Program Requirements, shall be maintained. The standard ANSI/ASQC Q-9003-1994 Quality Systems Model for Quality Assurance in Final Inspection and Test, shall be complied with.

5.2 MECHANICAL DESIGN AND MANUFACTURE

The mechanical design and manufacture of the Voice Switch ByPass equipment/modules and component parts shall comply with the following requirements of FAA-G-2100H:

Voice Switch ByPass Item	FAA-G-2100H Compliance Paragraph
Electronic Equipment Assembly Requirements	3.2.2.1
Component Mounting	3.2.2.1.1
Printed Circuit Boards	3.2.2.1.2
Assembly	3.2.2.1.3
Wire Wrap	3.2.2
Nameplates and Marking	3.3.3
Interchangeability	3.3.4
Personnel Safety and Health	3.3.5
Documentation	3.4
Strain Relief	3.3.1.3.1
Painted Finish	3.3.1.3.2
Wiring	3.3.1.4.10

5.3 CONFIGURATION AUDIT REPORTS

6.0 TESTING REQUIREMENTS

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6.1 NOT USED

6.2 FACTORY ACCEPTANCE TEST

Factory Acceptance Testing shall be conducted in accordance with the FAA approved procedure, Y1-02-0103 Rev. K, dated March 19, 2008 (including subsequent revisions). The test results will be used to verify and substantiate that the Voice Switch By-Pass equipment/modules and component parts conform to the requirements of this document.

6.2.1 Data

The following data will be recorded for each test performed:

Description	Data
Serial Number	
Installation Site	
FAA Circuit Type or "Test"	
Jackbox Serial Number(s)	

6.2.2 Channel 1 Frequency 1 Circuit Tests

Tests will be performed to determine if the component parts passes or fails the stated criteria. Only component parts that pass the criteria may be considered for shipment.

Description/Requirements	Minimum	Measurement	Maximum	Pass/Fail (circle one)
RX Gain Range Setup				
Headset output maximum power.	-16.0 dBm	_____ dBm	-16.0 dBm	P F
Receive Input to Headset Output Test				
Headset output limiter	-15.0 dBm	_____ dBm	-11.0 dBm	P F
Headset output maximum power.	-18.0 dBm	_____ dBm	-13.0 dBm	P F
Headset output minimum power.	-43.0 dBm	_____ dBm	-39.0 dBm	P F
Receive Input to Recorder Output Test				
Recorder output maximum power.	-11.5 dBm	_____ dBm	-8.5 dBm	P F
Recorder output minimum power.	-36.5 dBm	_____ dBm	-33.5 dBm	P F
Microphone Input to Transmit Output Test				
Transmit output nominal power.	-9.5 dBm	_____ dBm	-6.5 dBm	P F
Microphone Input to Recorder Output Test				
Recorder output power.	-11.5 dBm	_____ dBm	-8.5 dBm	P F
Microphone Input to Headset Output Test (Sidetone)				
Headset (Sidetone) output minimum power.	-40.5 dBm	_____ dBm	-35.5 dBm	P F
Headset (Sidetone) output maxinmum power.	-27.5 dBm	_____ dBm	-24.5 dBm	P F

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Circuit Pass Through – Un-Energized Relays					
RX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P	F
TX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P	F
TB-1, pin 5A to 5D	0 ohms	_____ ohms	10 ohms	P	F
TB-1, pin 6A to 6D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 25A to 25D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 26A to 26D	0 ohms	_____ ohms	10 ohms	P	F

6.2 3 Channel 1 Frequency 2 Circuit Tests if Type 2

Description	**Minimum**	**Measurement**	**Maximum**	**Pass/Fail** (circle one)
Receive Input to Headset Output Test				
Headset output maximum power	-18 0 dBm	_____ dBm	-13 0 dBm	P F
Headset output minimum power	-43 0 dBm	_____ dBm	-39 0 dBm	P F
Receive Input to Recorder Output Test				
Recorder output maximum power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Recorder output minimum power	-36 5 dBm	_____ dBm	-33 5 dBm	P F
Microphone Input to Transmit Output Test				
Transmit output nominal power	-9 5 dBm	_____ dBm	-6 5 dBm	P F
Circuit Pass Through – Un-Energized Relays				
RX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TB-1, pin 17A to 17D	0 ohms	_____ ohms	10 ohms	P F
TB-1, pin 18A to 18D	0 ohms	_____ ohms	10 ohms	P F

6.2.4 Channel 2 Frequency 1 Circuit Tests

Tests will be performed to determine if the component parts passes or fails the stated criteria Only component parts that pass the criteria may be considered for shipment

Description/Requirements	**Minimum**	**Measurement**	**Maximum**	**Pass/Fail** (circle one)
RX Gain Range Setup				
Headset output maximum power	-16 0 dBm	_____ dBm	-16 0 dBm	P F
Receive Input to Headset Output Test				
Headset output limiter	-15 0 dBm	_____ dBm	-11 0 dBm	P F
Headset output maximum power	-18 0 dBm	_____ dBm	-13 0 dBm	P F
Headset output minimum power	-43 0 dBm	_____ dBm	-39 0 dBm	P F
Receive Input to Recorder Output Test				
Recorder output maximum power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Recorder output minimum	-36 5 dBm	_____ dBm	-33 5 dBm	P F

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power				
Microphone Input to Transmit Output Test				
Transmit output nominal power	-9 5 dBm	_____ dBm	-6 5 dBm	P F
Microphone Input to Recorder Output Test				
Recorder output power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Microphone Input to Headset Output Test (Sidetone)				
Headset (Sidetone) output minimum power	-40 5 dBm	_____ dBm	-35 5 dBm	P F
Headset (Sidetone) output maximmum power	-27 5 dBm	_____ dBm	-24 5 dBm	P F
Circuit Pass Through – Un-Energized Relays				
RX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TB-1, pin 29A to 29D	0 ohms	_____ ohms	10 ohms	P F
TB-1, pin 30A to 30D	0 ohms	_____ ohms	10 ohms	P F
TB-2, pin 27A to 27D	0 ohms	_____ ohms	10 ohms	P F
TB-2, pin 28A to 28D	0 ohms	_____ ohms	10 ohms	P F

6.2.5 Channel 2 Frequency 2 Circuit Tests if Type 2

Description	**Minimum**	**Measurement**	**Maximum**	**Pass/Fail** (circle one)
Receive Input to Headset Output Test				
Headset output maximum power	-18 0 dBm	_____ dBm	-13 0 dBm	P F
Headset output minimum power	-43 0 dBm	_____ dBm	-39 0 dBm	P F
Receive Input to Recorder Output Test				
Recorder output maximum power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Recorder output minimum power	-36 5 dBm	_____ dBm	-33 5 dBm	P F
Microphone Input to Transmit Output Test				
Transmit output nominal power	-9 5 dBm	_____ dBm	-6 5 dBm	P F
Circuit Pass Through – Un-Energized Relays				
RX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TB-1, pin 41A to 41D	0 ohms	_____ ohms	10 ohms	P F
TB-1, pin 42A to 42D	0 ohms	_____ ohms	10 ohms	P F

6.2.6 Channel 3 One Position To One Or Two Frequencies Frequency 1 Circuit Tests

Tests will be performed to determine if the component parts passes or fails the stated criteria Only component parts that pass the criteria may be considered for shipment.

Description/Requirements	**Minimum**	**Measurement**	**Maximum**	**Pass/Fail** (circle one)
RX Gain Range Setup				

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Headset output maximum power.	-16.0 dBm	_____ dBm	-16.0 dBm	P	F
Receive Input to Headset Output Test					
Headset output limiter	-15.0 dBm	_____ dBm	-11.0 dBm	P	F
Headset output maximum power.	-18.0 dBm	_____ dBm	-13.0 dBm	P	F
Headset output minimum power.	-43.0 dBm	_____ dBm	-39.0 dBm	P	F
Receive Input to Recorder Output Test					
Recorder output maximum power.	-11.5 dBm	_____ dBm	-8.5 dBm	P	F
Recorder output minimum power.	-36.5 dBm	_____ dBm	-33.5 dBm	P	F
Microphone Input to Transmit Output Test					
Transmit output nominal power.	-9.5 dBm	_____ dBm	-6.5 dBm	P	F
Microphone Input to Recorder Output Test					
Recorder output power.	-11.5 dBm	_____ dBm	-8.5 dBm	P	F
Microphone Input to Headset Output Test (Sidetone)					
Headset (Sidetone) output minimum power.	-40.5 dBm	_____ dBm	-35.5 dBm	P	F
Headset (Sidetone) output maxinmum power.	-27.5 dBm	_____ dBm	-24.5 dBm	P	F
Circuit Pass Through – Un-Energized Relays					
RX Audio	-8.5 dBm	_____ dBm	-7.5 dBm	P	F
TX Audio	-8.5 dBm	_____ dBm	-7.5 dBm	P	F
TB-2, pin 5A to 5D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 6A to 6D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 29A to 29D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 30A to 30D	0 ohms	_____ ohms	10 ohms	P	F

6.2.7 Channel 3 One Position To One Or Two Frequencies Frequency 2 Circuit Tests if Type 2

Description	**Minimum**	**Measurement**	**Maximum**	**Pass/Fail** (circle one)	
Receive Input to Headset Output Test					
Headset output maximum power.	-18.0 dBm	_____ dBm	-13.0 dBm	P	F
Headset output minimum power.	-43.0 dBm	_____ dBm	-39.0 dBm	P	F
Receive Input to Recorder Output Test					
Recorder output maximum power.	-11.5 dBm	_____ dBm	-8.5 dBm	P	F
Recorder output minimum power.	-36.5 dBm	_____ dBm	-33.5 dBm	P	F
Microphone Input to Transmit Output Test					
Transmit output nominal power.	-9.5 dBm	_____ dBm	-6.5 dBm	P	F
Circuit Pass Through – Un-Energized Relays					
RX Audio	-8.5 dBm	_____ dBm	-7.5 dBm	P	F
TX Audio	-8.5 dBm	_____ dBm	-7.5 dBm	P	F
TB-2, pin 17A to 17D	0 ohms	_____ ohms	10 ohms	P	F
TB-2, pin 18A to 18D	0 ohms	_____ ohms	10 ohms	P	F

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6.2.8 Channel 3 Two Positions to One Frequency Position1 Circuit Tests

Tests will be performed to determine if the component parts passes or fails the stated criteria Only component parts that pass the criteria may be considered for shipment

Description/Requirements	Minimum	Measurement	Maximum	Pass/Fail (circle one)
RX Gain Range Setup				
Headset output maximum power	-16 0 dBm	_____ dBm	-16 0 dBm	P F
Receive Input to Headset Output Test				
Headset output limiter	-15 0 dBm	_____ dBm	-11 0 dBm	P F
Headset output maximum power	-18 0 dBm	_____ dBm	-13 0 dBm	P F
Headset output minimum power	-43 0 dBm	_____ dBm	-39 0 dBm	P F
Receive Input to Recorder Output Test				
Recorder output maximum power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Recorder output minimum power	-36 5 dBm	_____ dBm	-33 5 dBm	P F
Microphone Input to Transmit Output Test				
Transmit output nominal power	-9 5 dBm	_____ dBm	-6 5 dBm	P F
Microphone Input to Recorder Output Test				
Recorder output power	-11 5 dBm	_____ dBm	-8 5 dBm	P F
Microphone Input to Headset Output Test (Sidetone)				
Headset (Sidetone) output minimum power	-40 5 dBm	_____ dBm	-35 5 dBm	P F
Headset (Sidetone) output maximum power	-27 5 dBm	_____ dBm	-24 5 dBm	P F
Circuit Pass Through – Un-Energized Relays				
RX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TX Audio	-8 5 dBm	_____ dBm	-7 5 dBm	P F
TB-2, pin 5A to 5D	0 ohms	_____ ohms	10 ohms	P F
TB-2, pin 6A to 6D	0 ohms	_____ ohms	10 ohms	P F
TB-2, pin 29A to 29D	0 ohms	_____ ohms	10 ohms	P F
TB-2, pin 30A to 30D	0 ohms	_____ ohms	10 ohms	P F

6 2.9 Channel 3 Two Positions to One Frequency Position 2 Circuit Tests

Description	Minimum	Measurement	Maximum	Pass/Fail (circle one)
Receive Input to Headset Output Test				
Headset output limiter	-15 0 dBm	_____ dBm	-11 0 dBm	P F
Headset output maximum power	-18 0 dBm	_____ dBm	-13 0 dBm	P F
Headset output minimum power	-43 0 dBm	_____ dBm	-39 0 dBm	P F
Receive Input to Recorder Output Test				

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Description	Minimum	Measurement	Maximum	Pass/Fail (circle one)
Recorder output maximum power.	-11.5 dBm	_____ dBm	-8.5 dBm	P F
Recorder output minimum power.	-36.5 dBm	_____ dBm	-33.5 dBm	P F
Microphone Input to Transmit Output Test				
Transmit output nominal power.	-9.5 dBm	_____ dBm	-6.5 dBm	P F
Microphone Input to Recorder Test				
Recorder output power.	-11.5 dBm	_____ dBm	-8.5 dBm	P F
Microphone Input to Headset Output Test (Sidetone)				
Headset (Sidetone) output minimum power.	-40.5 dBm	_____ dBm	-35.5 dBm	P F
Headset (Sidetone) output maxinmum power.	-27.5 dBm	_____ dBm	-24.5 dBm	P F
Channel 3 Position 2 Frequency 1 Circuit Pass Through – Un-Energized Relays				
TB-2, pin 31A to 31D	0 ohms	_____ohms	10 ohms	P F
TB-2, pin 32A to 32D	0 ohms	_____ohms	10 ohms	P F

7.0 PREPARATION FOR DELIVERY

The requirements for packaging, packing and marking for shipment shall be in accordance with FAA-G-2100H, paragraph 5 and the applicable section of the contract. The contract shall take precedence.

8.0 WARRANTY

Voice Switch ByPass equipment/modules and component parts shall have a three year warranty that the Voice Switch ByPass equipment/modules and component parts are free from material defects in material and workmanship when installed and used normally in accordance with FAA approved operation instructions and Technical Instruction Book, TI 6650.50, with the exception of the batteries within the UPS.

The warranty for UPS batteries shall be in accordance with the specific manufacturer's warranty.

The warranty commences upon delivery and acceptance of the VSBP at the FOB destination point.

During the warranty period, the Voice Switch ByPass equipment/modules and component parts shall be replaced to meet the requirements of this document without charge to the FAA.

9.0 TECHNICAL INSTRUCTION BOOK

9.1 FAA specification FAA-D-2494/b, Appendix 1 provides guidance for commercial technical instruction books.

9.2 The commercial Technical Instruction Book shall include a general description of a set of Voice Switch ByPass modules as they would be installed and used in an operational air traffic control environment.

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a. The commercial Technical Instruction Book shall include a technical description of each of the individual Voice Switch ByPass modules as they would be used as a set in an operational air traffic control environment.

b. The Technical Instruction Book shall include procedures for operation, standards and tolerances, periodic maintenance, and corrective maintenance.

c. The Technical Instruction Book shall include a parts list, installation, outline drawings, wiring diagrams, and schematics, for each module.

d. The contents of the Technical Instruction Book shall be subject to approval by the Federal Aviation Administration prior to production of the final deliverable.

9.3 Upon reading the Technical Instruction Book the air traffic controller, technician, or engineer will, at a minimum, have knowledge of and be able to:

a. Operate the set of Voice Switch ByPass modules as a system;

b. Perform all periodic maintenance actions;

c. Perform fault isolation to the module level,

d. Perform corrective maintenance and alignments to restore the module to specified parameters.

e. Perform corrective maintenance and alignments to restore a set of Voice Switch ByPass modules (as a system) to specified parameters.

9.4 The Technical Instruction Book be shall be developed, produced and delivered in Microsoft Word on a compact disk media without restriction on reproduction.

a. A draft commercial Technical Instruction Book shall be delivered to the Federal Aviation Administration for review, comment, and approval.

b. A final commercial Technical Instruction Book, that incorporates the comments received, shall be delivered to the Federal Aviation Administration for review, comment, and approval.

10.0 TRAINING VIDEO

The Training Video shall be a video-taped training that demonstrates operator and maintenance activities for the set of Voice Switch ByPass modules as would be used in an operational environment. The training video shall be cross referenced to the Technical Instruction Book. The training video shall be approximately 30 minutes in length and shall be delivered without restriction on reproduction. The contents and script of the training video shall be subject to approval by the Federal Aviation Administration prior to production.

10.1 The target audience for the training video will be air traffic controllers, electronics technicians, and electronic engineers with experience in the use, maintenance, and repair of communications switching equipment.

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10.2 The training video shall be divided into two parts. Part One shall describe the overall set of voice Switch ByPass modules as an operational system. The training video shall demonstrate all operational functions of the set of Voice Switch ByPass modules. Part Two shall demonstrate all periodic preventive maintenance procedures required for the set of Voice Switch ByPass modules as a system. The training video shall provide demonstration information to isolate system faults to the module level and demonstrate all corrective actions or alignments required to restore the overall set of Voice Switch Bypass modules as a system to operation service after module replacement. Demonstrated procedures shall be cross referenced to the Technical Instruction Book..

10.3 Upon viewing the training video and using the procedures identified in the Technical Instruction Book, the student/viewer will at a minimum have knowledge of and be able to:

a. Operate the set of Voice Switch ByPass modules as a system;

b. Perform all periodic maintenance actions;

c. Perform fault isolation, corrective maintenance and alignments to restore the module and set of Voice Switch ByPass modules as a system performance to specified parameters.

10.4 The training video shall be produced and delivered in a DVD formatted media without restriction on reproduction..